

CLAIMS

WHAT IS CLAIMED:

1. A system for chemical mechanical polishing, comprising:

5 a movable and actuatable polishing head configured to receive and hold in place a substrate;

a polishing pad mounted on a platen that is coupled to a first drive assembly;

a pad conditioning assembly coupled to a second drive assembly including at least one electric motor; and

10 a control unit operatively connected to said polishing head and first and second drive assemblies, said control unit being configured to control the operation of said first and second drive assemblies, wherein said control unit is further configured to provide, upon receiving a sensor signal from said second drive assembly, an indication of at least one characteristic of a consumable member
15 of said system.

2. The system of claim 1, wherein said sensor signal received from said second drive assembly is indicative of at least one of a revolution of said at least one electric motor and a torque of said at least one motor.

20 3. The system of claim 1, wherein said control unit is further configured to control at least one of said first drive assembly and said polishing head on the basis of said sensor signal.

4. A method of operating a CMP system, comprising:
obtaining a sensor signal from an electric drive assembly driving a pad conditioner of
said CMP system; and
estimating a condition of said pad conditioner on the basis of said sensor signal.

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5. The method of claim 4, wherein said sensor signal is indicative of at least one
of a revolution of at least one electric motor of said drive assembly and a torque of said at
least one motor.

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6. The method of claim 5, wherein estimating said condition of said pad
conditioner includes:

establishing reference data for at least one characteristic of said pad conditioner; and
comparing said sensor signal with said reference data.

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7. The method of claim 6, wherein said at least one characteristic includes a
frictional force acting between a conditioning surface of said pad conditioner and a polishing
pad during operation of said CMP system.

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8. The method of claim 4, further comprising predicting a remaining lifetime of
the conditioning surface of said pad conditioner on the basis of the estimated condition.

9. The method of claim 4, further comprising controlling operation of said CMP
system on the basis of said sensor signal.

10. The method of claim 9, wherein controlling operation of said CMP system includes readjusting at least one of a downforce, a polish time and a relative speed between a substrate and a polishing pad on the basis of said sensor signal.

5 11. The method of claim 9, wherein controlling operation of said CMP system includes readjusting a drive signal to said drive assembly on the basis of said sensor signal to adjust a conditioning effect.

10 12. A method of controlling a process sequence including a CMP process, comprising:
obtaining a signal from a conditioner drive assembly of a CMP system, said signal being indicative of at least one of a motor torque and a speed of a motor of said drive assembly; and
adjusting at least one process parameter in said process sequence on the basis of said
15 signal.

13. The method of claim 12, wherein said at least one process parameter includes at least one of a downforce, a polish time and relative speed of a pad and a polishing head in said CMP system.

20 14. The method of claim 12, wherein said at least one process parameter includes a deposition specific parameter of a deposition tool arranged upstream of said CMP system.

25 15. The method of claim 12, further comprising estimating a status of at least one consumable component of said CMP system on the basis of said signal.

16. A method of estimating a lifetime of consumables in a CMP system, the method comprising:

determining the status of a first conditioning surface of a pad conditioner at a plurality

of time points while using said first conditioning surface under predefined operating conditions;

establishing a relationship between the status determined for each time point and a sensor signal indicating at least one parameter of a drive assembly for driving said pad conditioner; and

assessing said sensor signal when operating said CMP system under the predefined operating conditions with a second conditioning surface on the basis of said relationship to estimate a remaining lifetime of at least one consumable member of said CMP system.

17. The method of claim 16, further comprising determining an allowable range for said sensor signal.

18. The method of claim 17, further comprising indicating an invalid CMP system status when said sensor signal is outside of said allowable range.

19. The method of claim 17, further comprising determining a remaining lifetime of said at least one consumable member when said sensor signal is within the allowable range.

20. The method of claim 17, further comprising relating at least one of a removal rate and a polish time for a specific CMP recipe to said sensor signal to determine said allowable range.

5 21. The method of claim 16, wherein said sensor signal represents a motor torque of said drive assembly.